数学与系统科学研究院

计算数学所学术报告

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报告题目：

Generalized Multiscale Approximation of Mixed Finite Elements with Velocity Elimination for Subsurface Flow

邀请人：　黄记祖 副研究员

报告时间：**2019** 年 **6** 月 **12** 日（周三）

下午 **15:30-16:30**

报告地点：　数学院南楼七层

702 教室

Abstract:

A frame work of the mixed generalized multiscale finite element method (GMsFEM) for solving Darcy's law in heterogeneous media is studied in this talk. Our approach approximates pressure in multiscale function space that is between fine-grid space and coarse-grid space and solves velocity directly in the fine-grid space. To construct multiscale basis functions for each coarse-grid element, three types of snapshot space are raised. The first one is taken as the fine-grid space for pressure and the other two cases need to solve a local problem on each coarse-grid element. We describe a spectral decomposition in the snapshot space motivated by the analysis to further reduce the dimension of the space that is used to approximate the pressure. Since the velocity is directly solved in the fine-grid space, in the linear system for the mixed finite elements, the velocity matrix can be approximated by a diagonal matrix without losing any accuracy. Thus it can be inverted easily. This reduces computational cost greatly and makes our scheme simple and easy for application. Moreover, the proposed method preserves the local mass conservation property that is important for subsurface problems. Numerical examples are presented to illustrate the good properties of the proposed approach. If offline spaces are appropriately selected, one can achieve good accuracy with only a few basis functions per coarse element according to the numerical results.

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